

## EXPERIMENTAL EXAMINATION OF THE THERMOACOUSTIC INSTABILITY OF A LOW SWIRL FLAME WITH PLANAR LASER INDUCED FLUORESCENCE OF OH

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Thermoacoustic combustion instability results from the coupling between oscillating heat release and fluctuating pressure inside of a combustion chamber. In the current work, thermoacoustic instability in a low swirl burner is investigated for lean premixed conditions. Measurement of the heat release is a very important aspect of thermoacoustic instability, and in the current experiment the local heat release information is captured with a method based on Planar Laser Induced Fluorescence of the OH radical (OH-PLIF). This is then combined with the pressure signal to quantify the level of thermal-acoustic coupling. The specific goal is to examine the global and local flame response to velocity (5 – 10 m/s) and driving pressure amplitude (up to 1.12% of atmospheric pressure) changes. The root mean square of a non-dimensional Rayleigh index ( $R_{RMS}$ ) was analyzed as the indicator of the global response of flame to acoustic perturbation with different amplitudes. The result shows that the coupling level increases with the forcing amplitude in the beginning. However, when the forcing level is high enough, the coupling saturates. Local response is also examined using a locally-weighted  $R_{RMS}$ , focusing on the contribution of the positive and negative coupling regions to the global response. At low velocities, the positive and negative structures play similar roles. However, as velocity is increased, the positive structures become more dominant.